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(54) METHODS OF AND MEANS FOR ATTACHING STUDS TO METALLIC SURFACES

(71) We, GRUNDY & PARTNERS LIMITED, a British Company, of Bond's Mill, Stonehouse, Gloucestershire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to methods of and means for attaching a pin or stud to a metallic surface and is particularly relevant to the attachment of a pin or stud, hereinafter referred to as a stud, to a vertical surface of a railway track element using a brazing or soldering gun.

The gun may be as described in co-pending Application No. 1925/74 (British Patent Specification No. 1480101) to which reference should be made and the stud may be of brass with a cap or head portion of a solder such as silver solder. When an arc is established between the stud and the surface, the solder is melted and a pool of the solder is formed. The stud is caused to enter this pool so that, on solidification of the solder, the stud becomes bonded to the surface.

The invention lies in a method of attaching a metal stud to a metallic surface to project therefrom, wherein a soldered joint is formed by drawing an arc between the surface and a cap of solder on the stud, and then advancing the stud towards the surface, characterised in that a metallic ring is positioned against the surface around the cap with clearances such that, on fusion of the solder and advance of the stud, the solder flows between facing areas of the ring and the surface and between the facing areas of the ring and the stud thereby affixing the stud within the ring with both the stud and the ring affixed to the surface.

To provide the clearance between the facing areas of the ring and the surface, spaced projections are conveniently formed on the ring to contact the surface. The stud and the ring may be pressed against the surface by a brazing or soldering gun, the stud being fitted at the end of a spring-loaded plunger which is electromagnetically retractable for drawing the arc, and the ring being fitted into a refractory ferrule which closely surrounds the stud and is mounted in a nose portion of the gun.

The invention also embraces an assembly comprising a metal stud soldered by the aforesaid method to a metallic surface and within a metallic ring which is also soldered to the surface. The ring is preferably so shaped in relation to the stud that solder flows between the ring and the stud into an outwardly coned annular space.

The invention also includes the combination of parts for carrying out the aforesaid method, the parts comprising a solder-capped metal stud and a metallic ring having a generally planar front end face with spaced projections thereon to provide clearance for solder flow and with a cylindrical bore receiving the stud, which bore opens conically at the rear end of the ring.

The invention will now be described by way of example with reference to the accompanying drawings which illustrate the attachment of metal studs to railway lines using a soldering gun constructed as described in co-pending Application No. 1925/74 (British Patent Specification 1480101). In the drawings:—

Figure 1 is a diagrammatic representation of a soldering operation,

Figure 2 is a sectional view of a metallic ring,

Figure 3 is a perspective view of a stud,

Figure 4 is a perspectivev iew of a ceramic ferrule, and

Figure 5 is a detailed view showing a stud attached to a railway line.

The soldering gun 10 includes an electromagnet, spring means for biasing the stud 11 away from the electromagnet and electrical connector means for completion of an electric circuit which includes the electromagnet, part of the railway line 12 and the stud 11. Timer and control means are pro-

vided such that, on initiation of operation of the gun 10, the electromagnet is energised to draw the stud 11 towards it and away from the railway line 12 whilst an electric arc is established between the stud 11 and the railway line 12. The timer means then acts to de-energise the electromagnet and interrupt the electrical circuit so that the stud 11 is moved by the spring means away from the electromagnet and towards the railway line.

The stud 11 consists of an externally threaded main body portion 13 which is of brass and a head portion 14 at one end of the body portion 13 which is of silver solder. When the electric arc is formed, the heat thereby generated causes fusion of the silver solder so that a pool of molten solder is formed on the surface of the railway line. At the completion of the arc generation process, the stud 11 is pressed into this molten pool so that, when the silver solder solidifies, the body portion 13 of the stud 11 is positively attached to the railway line 12.

Location of the stud in the correct position is obtained using a ceramic ferrule 15 which may be of the same construction as the ferrule described in co-pending Application No. 1925/74 (British Patent Specification No. 148101). However, the ferrule 15 does not engage the surface of the railway line 12, instead a copper ring 16 is provided, having a pair of opposed surfaces 17 and 18, one 17 of which is engaged by the ferrule 15 and the other 18 of which is directed towards the surface of the railway line 12. This latter generally planar surface 18 is provided with four spaced pips or projections 19 which are disposed at 90° to one another and act to space this surface of the copper ring 16 a controlled short distance from the surface of the railway line 12. The pips or projections 19 are located at the outer edge of the surface 18 and are formed by upsetting the periphery of the ring 16.

The surface 17 of the copper ring 16 next to the ferrule 15 is provided with an inner circumferential rim 20 which serves as a guide or location element entering the ferrule 15 to ensure correct positioning of the copper ring 16. The bore 21 receives the stud with a small clearance and is outwardly flared or chamfered as indicated at 22.

In use, a capillary action is obtained so that, when the molten pool of silver solder is formed, the molten solder is drawn into the space between the copper ring 16 and the railway line 12, as indicated in Figure 5, whereby a large area of contact between the solder and the railway line 12 is ensured and an effective bond is obtained. To some extent, the copper ring 16 acts as an anti-gravity device in that it induces upward flow of the silver solder so that substantially uniform dispersal of the solder is effected. The chamfer 22 provides an outwardly conical space in which the molten solder, on solidification, forms a fillet to increase the bonding between the silver solder and the ring 16 by providing a degree of mechanical interlock.

Although the use of the copper ring 16 is of particular advantage when the surface of the railway line to which the stud 11 is to be attached is vertical, there is no reason why the copper ring 16 should not be used when the surface is inclined or even horizontal.

WHAT WE CLAIM IS:—

1. A method of attaching a metal stud to a metallic surface to project therefrom, wherein a soldered joint is formed by drawing an arc between the surface and a cap of solder on the stud, and then advancing the stud towards the surface, characterised in that a metallic ring is positioned against the surface around the cap with clearances such that, on fusion of the solder and advance of the stud, the solder flows between facing areas of the ring and the surface and between facing areas of the ring and the stud thereby affixing the stud within the ring with both the stud and the ring affixed to the surface.

2. A method according to claim 1, wherein, to provide the clearance between facing areas of the ring and the surface, spaced projections are formed on the ring to contact the surface.

3. A method according to claim 1 or 2, wherein the stud and the ring are pressed against the surface by a brazing or soldering gun, the stud being fitted at the end of a spring-loaded plunger which is electromagnetically retractable for drawing the arc, and the ring being fitted into a refractory ferrule which closely surrounds the stud and is mounted in a nose portion of the gun.

4. An assembly comprising a metal stud soldered by the method of claim 1 to a metallic surface and within a metallic ring which is also soldered to the surface.

5. An assembly according to claim 4, wherein the ring is so shaped in relation to the stud that solder flows between the ring and the stud into an outwardly coned annular space.

6. The combination of parts for carrying out the method of claim 1, the parts comprising a solder-capped metal stud and a metallic ring having a generally planar front end face with spaced projections thereon to provide clearance for solder flow and with a cylindrical bore receiving the stud, which bore opens conically at the rear end of the ring.

7. The combination of parts for carrying out the method of claim 3, the parts comprising a solder-capped metal stud, a refractory ferrule slidable on the stud and a metal-

lic ring fitting in the ferrule and adapted to be axially movable thereby, the metallic ring having a generally planar front face with spaced projections thereon to provide clearance for solder flow and with a cylindrical bore receiving the stud, which bore opens conically at the rear end of the ring.

8. A method according to claim 1, substantially as herein described with reference to the accompanying drawings.

9. The combination of parts according to claim 6, the metallic ring being substantially as shown in Figure 2 for the making of a joint as shown in Figure 5.

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1486516 COMPLETE SPECIFICATION

2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

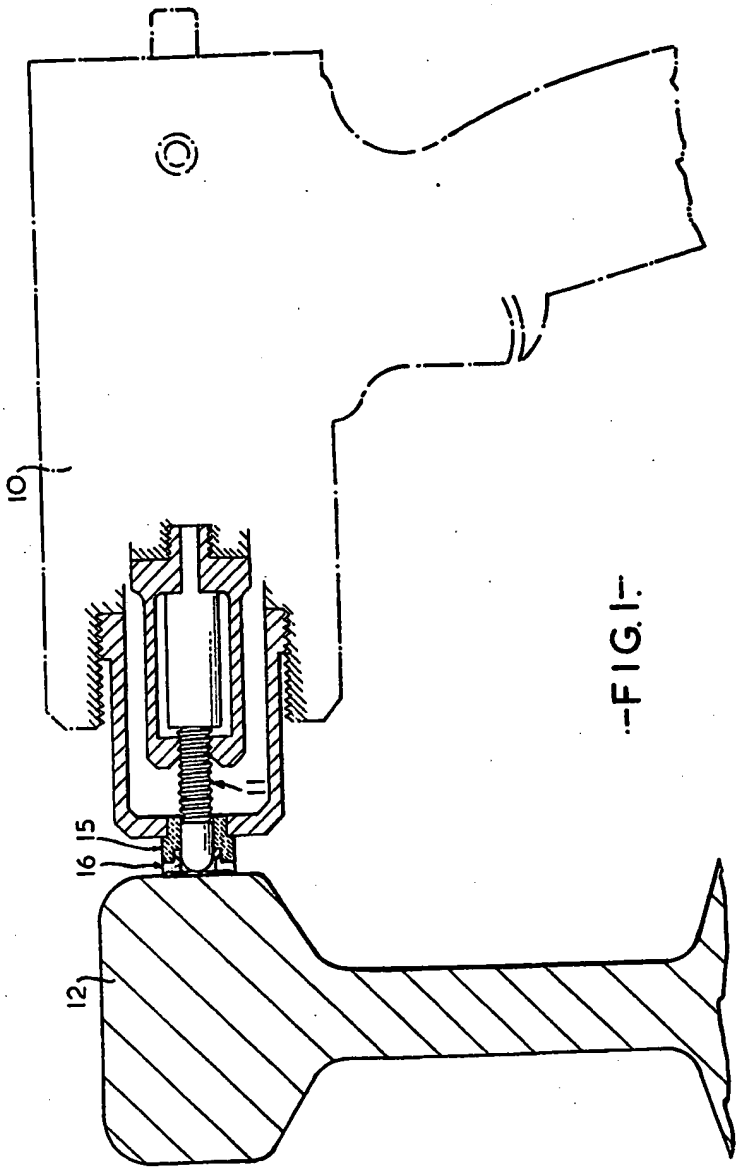
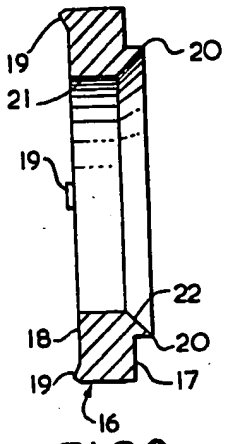


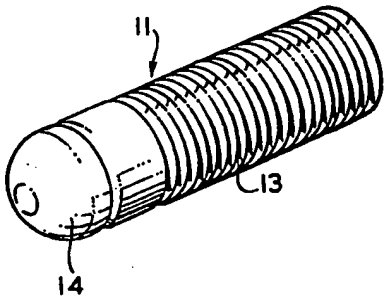
FIG. 1.

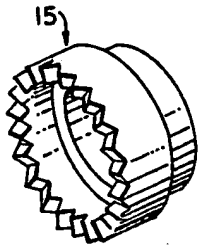
1486516 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 2



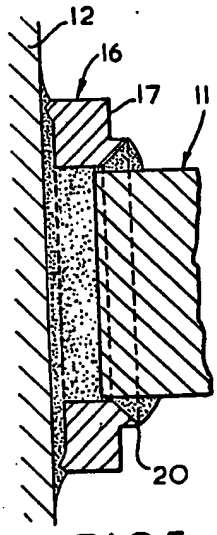
-FIG.2.-

-FIG.3.-





-FIG.4.-



-FIG.5.-